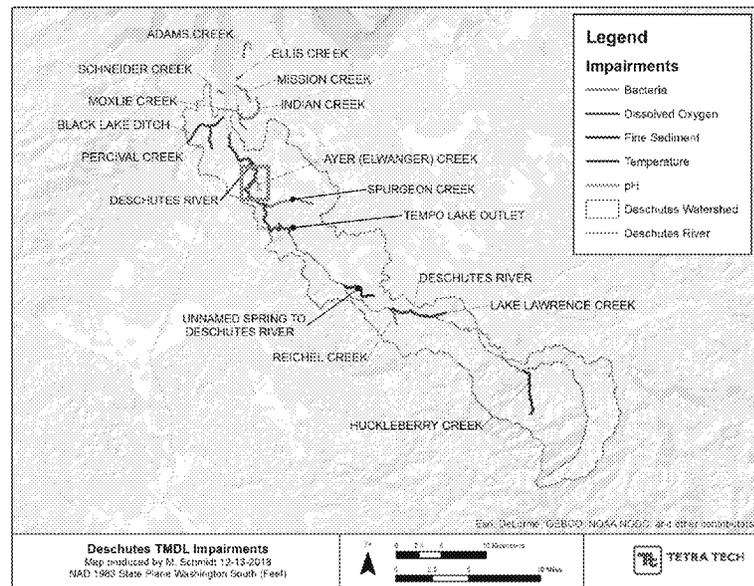


Ayer Creek Pilot Model

- Impaired for DO, pH, and water temperature



Ayer Creek Pilot Model

- Impaired for
DO, pH, and
water
temperature



Ayer Creek Pilot Model

- Mapped wetland areas

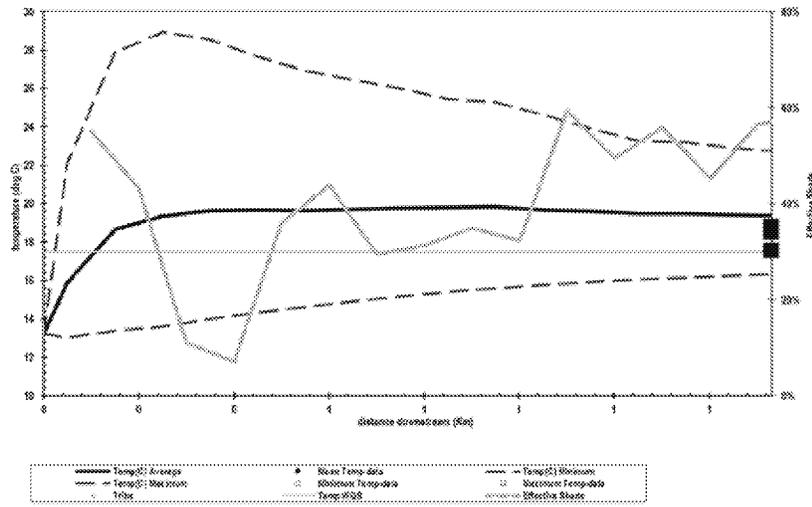


Calibration Model

- Calibration model date – 8/11/2004 (same as the Deschutes River model and WQS not met for pH, DO, and temperature)
- Ttools derived inputs for the Shade model
- Shade model run for 8/11/2004 and outputs used for QUAL2Kw
- Parameterization informed by Deschutes model, references from the literature, QUAL2Kw guidance
- Established parameters fitting for Ayer Creek
 - Reaeration: Tsivoglou-Neal for low flow, sluggish reaches
 - Groundwater quality in the vicinity of Ayer Creek based on Sinclair and Bilhimer study (2007)
- Completed comprehensive calibration

Ayer Creek (8/11/2004)

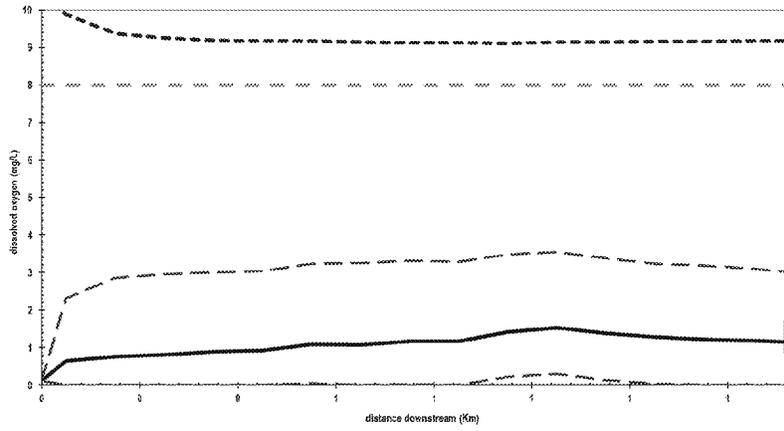
Temperature



Data limited to downstream end

Ayer Creek (8/11/2004)

DO

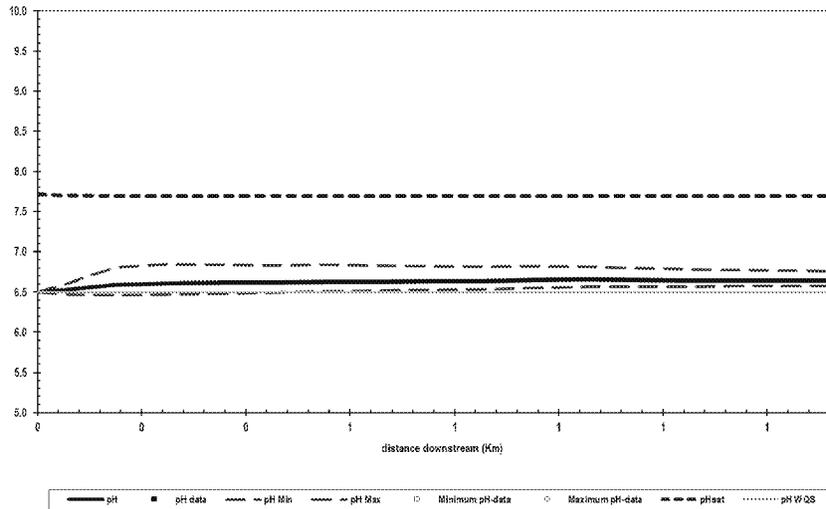


**Groundwater
DO =
0.12 mg/L**



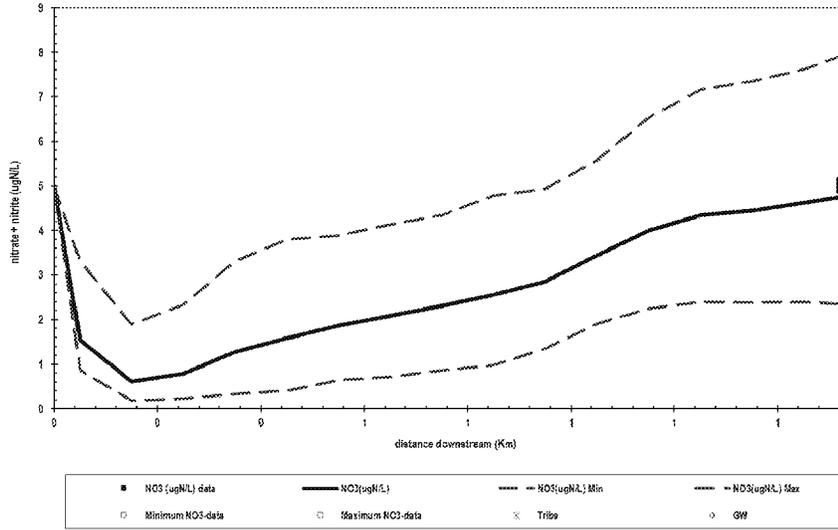
Ayer Creek (8/11/2004)

pH



Ayer Creek (8/11/2004)

NO₃

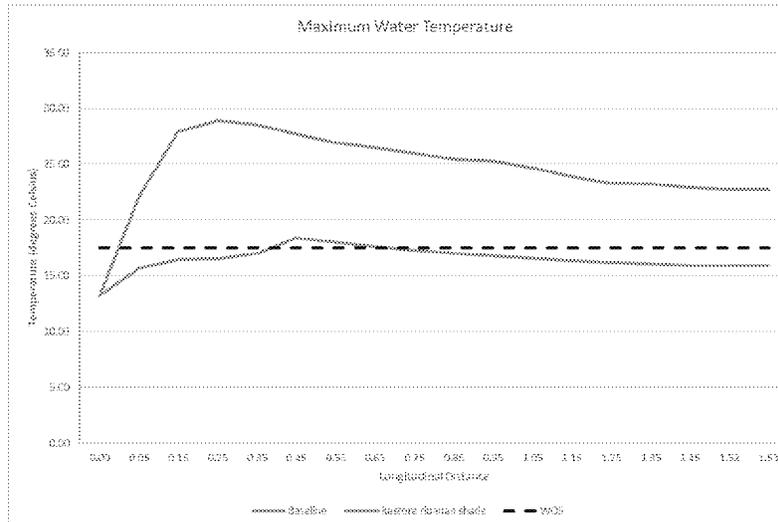


Critical Conditions Model

- 7Q10 flow (slightly lower than calibration model flow)
- 90th percentile air and dew point temperatures
- Parameterization maintained from the calibration model

Completed example scenarios (e.g., nutrient reductions, restored shade)

Water Temperature – Critical Conditions



**Longitudinal
Average
Maximum Daily
Temperatures**

**Baseline:
24.6°C**

**Restore
riparian shade:
16.5°C**





Evidence of
historic channel
modifications

pH

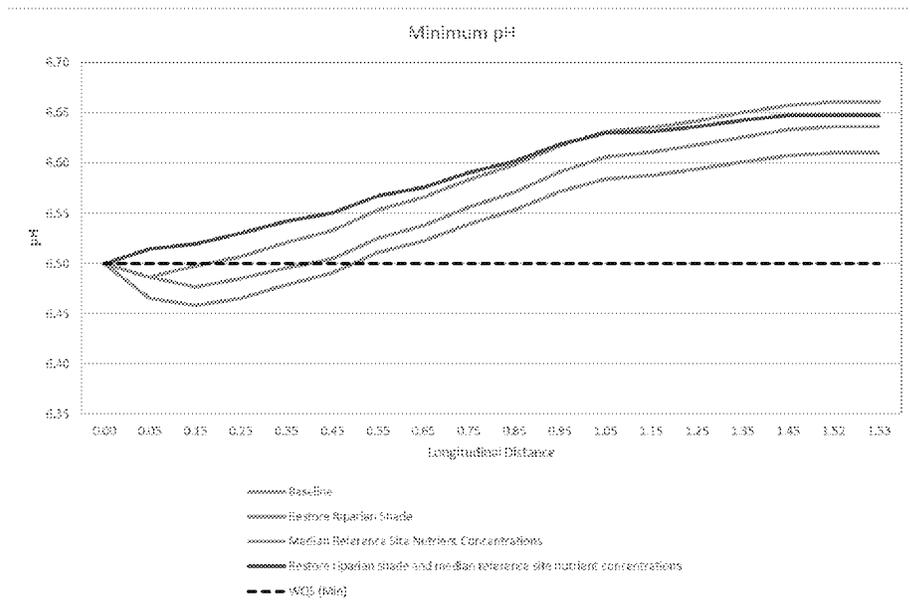
Baseline Nutrients:

0.18 mg-N/L
0.12 mg-P/L

Washington Reference Sites (N-STEPS)

Median for Puget Lowlands:
0.358 mg-N/L
0.015 mg-P/L

Lower N concentration in Ayer Creek potentially due to enhanced denitrification



Consideration of natural pH of wetlands

Ex. 5 Deliberative Process (DP)

DO

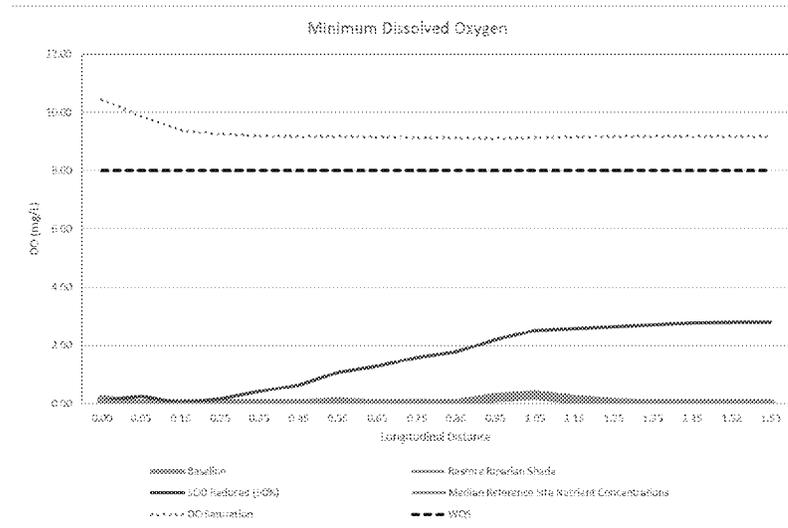
Summary of DO Monitoring for Ayer Creek

Observed:

DO Low
1.05 mg/L
(August)

DO High
8.6 mg/L
(early April)

Year-round
DO mean
3.6 mg/L



SOD – Sediment Oxygen Demand

Natural Conditions

- "Natural conditions" or "natural background levels" means surface water quality that was present before any human-caused pollution. When estimating natural conditions in the headwaters of a disturbed watershed it may be necessary to use the less disturbed conditions of a neighboring or similar watershed as a reference condition. (See also WAC 173-201A260(1).)

Natural Conditions for Ayer

- Headwater and diffuse flows – critical conditions
- Northern Thurston County Groundwater Report - Geohydrologic unit: Qvt
 - DO – 0.8 mg/L
 - pH – 6.8
- N-STEPS Analysis for Washington – Nutrient Concentrations from Reference Sites (median concentration for Puget Lowlands)
 - TN – 0.358 mg/L (higher than observations)
 - TP – 0.015 mg/L
- SOD and phytoplankton algae: negligible
- Restoration of riparian shade

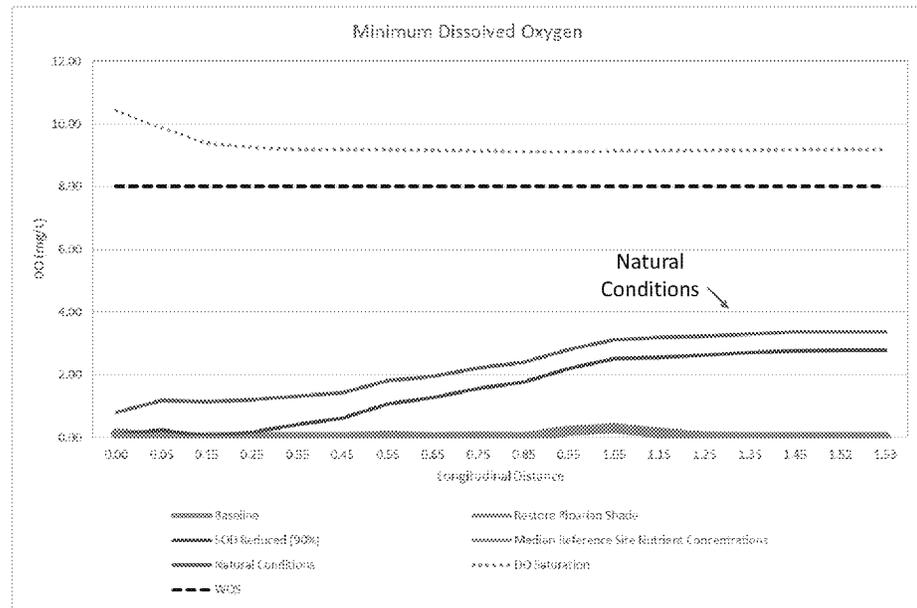
Longitudinal
Averages:

Minimum DO:
2.3 mg/L

pH: 6.8

Maximum
Temperature:
15.6°C

DO WQS
violated under
natural
conditions



Option for Defining Loading Capacity

- Human activity may not reduce DO concentrations by more than 0.2 mg/L if natural conditions result in DO concentrations lower than the criterion

Ex. 5 Deliberative Process (DP)